

What is claimed is:

1. A method of producing reduced-quality MPEG coded video from original-quality MPEG coded video, the original-quality MPEG coded video including a set of non-zero AC discrete cosine transform (DCT) coefficients for 8x8 blocks in frames of the original-quality MPEG coded video, the reduced-quality MPEG coded video also having frames of 8x8 blocks, each frame in the reduced-quality MPEG coded video having a corresponding frame in the original-quality MPEG coded video, and each 8x8 block in each frame of the reduced-quality MPEG coded video having a corresponding block in a corresponding frame in the original-quality MPEG coded video, said method comprising the steps of:

selecting non-zero AC DCT coefficients from corresponding blocks in the original-quality MPEG coded video to be included in the blocks of the reduced-quality MPEG coded video so that each 8x8 block in each frame of the reduced-quality MPEG coded video has a number of bits encoding non-zero AC DCT coefficients that is generally proportional to the number of bits encoding non-zero AC DCT coefficients for the corresponding 8x8 block in the corresponding frame of original-quality MPEG coded video.

2. The method as claimed in claim 1, which includes computing a number of bits available for encoding the non-zero AC DCT coefficients in said each of the 8x8 blocks in each frame of the reduced-quality MPEG coded video, the number of bits available for encoding being computed by scaling the number of bits encoding non-zero AC DCT coefficients in the corresponding block of the corresponding frame of the

1 original-quality MPEG coded video by a scale factor for said each frame, the scale factor  
2 being selected to obtain a desired reduced bit rate in the MPEG coded video for said each  
3 frame.  
4

5 3. The method as claimed in claim 2, which includes computing a moving  
6 average of frame size of the frames in the original-quality MPEG coded video, and  
7 computing the scale factor for said each frame from the moving average of frame size  
8 and a desired frame size for the reduced-quality MPEG coded video.  
9

10 4. The method as claimed in claim 2, which includes computing a difference  
11 between the number of bits available for encoding the non-zero AC DCT coefficients in  
12 said each of the 8x8 blocks in each frame of the reduced-quality MPEG coded video and  
13 the number of bits used for encoding the non-zero AC DCT coefficients retained in said  
14 each of the 8x8 blocks in each frame of the reduce-quality MPEG coded video, and  
15 making available for encoding non-zero AC DCT coefficients of following blocks said  
16 difference between the number of bits.  
17

18 5. The method as claimed in claim 4, which includes accumulating said  
19 difference to produce an accumulated number of bits that were available for encoding  
20 non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded  
21 video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8  
22 blocks of the reduced-quality MPEG coded video, and making said accumulated number  
23 of bits available for encoding non-zero AC DCT coefficients in a certain number of

1 following blocks in the reduced-quality MPEG coded video by dividing said accumulated  
2 number of bits by said certain number of following blocks to compute a fraction of the  
3 accumulated number of bits that is available for encoding said each of the 8x8 blocks of  
4 said each frame of the reduced-quality MPEG coded video in addition to the number of  
5 bits computed by scaling the number of bits encoding non-zero AC DCT coefficients in  
6 the corresponding block of the corresponding frame of the original-quality MPEG coded  
7 video by the scale factor for said each frame.

8  
9 6. The method as claimed in claim 5, wherein said certain number of blocks  
10 is substantially equal to the number of blocks in said each frame, so that bits that are  
11 available but not used for encoding the AC DCT coefficients for the blocks in said each  
12 frame are made available for encoding the AC DCT coefficients for the blocks in a  
13 following frame.

14  
15 7. The method as claimed in claim 1, which includes computing a difference  
16 between a number of bits available for encoding the non-zero AC DCT coefficients in  
17 said each of the 8x8 blocks in each frame of the reduced-quality MPEG coded video and  
18 the number of bits used for encoding the non-zero AC DCT coefficients retained in said  
19 each of the 8x8 blocks in each frame of the reduce-quality MPEG coded video, and  
20 making said difference available for encoding non-zero AC DCT coefficients of  
21 following blocks.

22

1           8.     The method as claimed in claim 7, which includes accumulating said  
2     difference to produce an accumulated number of bits that were available for encoding  
3     non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded  
4     video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8  
5     blocks of the reduced-quality MPEG coded video, and making said accumulated number  
6     of bits available for encoding non-zero AC DCT coefficients in a certain number of  
7     following blocks.

8  
9           9.     The method as claimed in claim 8, wherein said accumulated number of  
10    bits is made available for encoding non-zero AC DCT coefficients in a certain number of  
11    following blocks of the reduced-quality MPEG coded video by dividing said accumulated  
12    number of bits by said certain number of following blocks of the reduced-quality MPEG  
13    coded video to compute a fraction of the accumulated number of bits that is available for  
14    encoding non-zero AC DCT coefficients in said each of the 8x8 blocks of the reduced-  
15    quality MPEG coded video in addition to the number of bits computed by scaling the  
16    number of bits encoding non-zero AC DCT coefficients in the corresponding block of the  
17    corresponding frame of the original-quality MPEG coded video by the scale factor for  
18    said each frame.

19  
20          10.    The method as claimed in claim 8, wherein said certain number of  
21    following blocks is substantially equal to the number of blocks in a frame, so that bits  
22    that are available but not used for encoding the AC DCT coefficients for the blocks in

1 said each frame are made available for encoding the AC DCT coefficients for the blocks  
2 in a following frame.

3

4 11. A method of producing reduced-quality MPEG coded video from original-  
5 quality MPEG coded video, the original-quality MPEG coded video including a set of  
6 non-zero AC discrete cosine transform (DCT) coefficients for 8x8 blocks in frames of the  
7 original-quality MPEG coded video, the reduced-quality MPEG coded video also having  
8 frames of 8x8 blocks, each frame in the reduced-quality MPEG coded video having a  
9 corresponding frame in the original-quality MPEG coded video, and each 8x8 block in  
10 each frame of the reduced-quality MPEG coded video having a corresponding block in a  
11 corresponding frame in the original-quality MPEG coded video, said method comprising,  
12 for each block in the reduced-quality MPEG coded video, the steps of:

13 (a) determining the number of bits used in encoding non-zero AC DCT  
14 coefficients in the corresponding block of original-quality MPEG coded video;

15 (b) computing a number of bits available for encoding AC DCT coefficients in the  
16 original-quality MPEG coded video by scaling the number of bits used in encoding non-  
17 zero AC DCT coefficients in the corresponding block of original-quality MPEG coded  
18 video with a scale factor; and

19 (c) selecting non-zero AC DCT coefficients in a certain order from the  
20 corresponding block in the original-quality MPEG coded video to be included in said  
21 each block of the reduced-quality MPEG coded video until the number of bits available  
22 for encoding the AC DCT coefficients in the block in the reduced-quality encoded video  
23 is not sufficient for encoding, in the block of the reduced-quality MPEG coded video, any

1 more of the AC DCT coefficients in the corresponding block of original-quality MPEG  
2 coded video.

3  
4 12. The method as claimed in claim 11, wherein said order is a parsing order  
5 of the non-zero AC DCT coefficients in the corresponding block in the original-quality  
6 MPEG coded video.

7  
8 13. The method as claimed in claim 11, which includes computing the scale  
9 factor from a bit rate of the original-quality MPEG coded video and a desired bit rate for  
10 the reduced-quality MPEG coded video.

11  
12 14. The method as claimed in claim 11, which includes computing the scale  
13 factor for each frame of the reduced-quality MPEG coded video from a moving average  
14 of the size of the corresponding frames in the original-quality MPEG coded video and a  
15 desired frame size for the reduced-quality MPEG coded video.

16  
17 15. The method as claimed in claim 11, which includes computing a  
18 difference between the number of bits available for encoding the non-zero AC DCT  
19 coefficients in said each of the 8x8 blocks in each frame of the reduced-quality MPEG  
20 coded video and the number of bits used for encoding the non-zero AC DCT coefficients  
21 retained in said each of the 8x8 blocks in each frame of the reduce-quality MPEG coded  
22 video, and making available for encoding non-zero AC DCT coefficients of following  
23 blocks said difference between the number of bits.



1 MPEG-2 coded video including a set of non-zero AC discrete cosine transform (DCT)  
2 coefficients for 8x8 blocks in frames of the original-quality MPEG-2 coded video, the  
3 reduced-quality MPEG-2 coded video also having frames of 8x8 blocks, each frame in  
4 the reduced-quality MPEG-2 coded video having a corresponding frame in the original-  
5 quality MPEG-2 coded video, and each 8x8 block in each frame of the reduced-quality  
6 MPEG-2 coded video having a corresponding block in a corresponding frame in the  
7 original-quality MPEG-2 coded video, said method comprising, for each frame in the  
8 reduced-quality MPEG-2 coded video, the steps of:

9 (a) computing a moving average of the size of the corresponding frame in the  
10 original-quality MPEG-2 coded video;

11 (b) computing a scale factor from the moving average of the size of the  
12 corresponding frame in the original-quality MPEG-2 coded video and a desired size of  
13 said each frame of the reduced-quality MPEG-2 coded video; and

14 (c) for each 8x8 block in said each frame:

15 (i) determining the number of bits used in encoding non-zero AC DCT  
16 coefficients in the corresponding block of original-quality MPEG-2 coded video;

17 (ii) computing a number of bits available for encoding AC DCT  
18 coefficients in the original-quality MPEG-2 coded video by scaling the number of  
19 bits used in encoding non-zero AC DCT coefficients in the corresponding block  
20 of original-quality MPEG-2 coded video with a scale factor, and

21 (iii) selecting non-zero AC DCT coefficients in a parsing order from the  
22 corresponding block in the original-quality MPEG-2 coded video to be included  
23 in said each block of the reduced-quality MPEG-2 coded video until the number



1 of bits available for encoding the AC DCT coefficients in the block in the  
2 reduced-quality encoded video is not sufficient for encoding, in the block of the  
3 reduced-quality MPEG-2 coded video, any more of the AC DCT coefficients in  
4 the corresponding block of original-quality MPEG-2 coded video.

5  
6 19. The method as claimed in claim 18, which includes computing a  
7 difference between the number of bits available for encoding the non-zero AC DCT  
8 coefficients in said each of the 8x8 blocks in each frame of the reduced-quality MPEG  
9 coded video and the number of bits used for encoding the non-zero AC DCT coefficients  
10 retained in said each of the 8x8 blocks in each frame of the reduce-quality MPEG coded  
11 video, and making available for encoding non-zero AC DCT coefficients of following  
12 blocks said difference between the number of bits.

13  
14 20. The method as claimed in claim 19, which includes accumulating said  
15 difference to produce an accumulated number of bits that were available for encoding  
16 non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded  
17 video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8  
18 blocks of the reduced-quality MPEG coded video, and making said accumulated number  
19 of bits available for encoding non-zero AC DCT coefficients in a certain number of  
20 following blocks in the reduced-quality MPEG coded video by dividing said accumulated  
21 number of bits by said certain number of following blocks to compute a fraction of the  
22 accumulated number of bits that is available for encoding said each of the 8x8 blocks of  
23 said each frame of the reduced-quality MPEG coded video in addition to the number of

